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THE PLANT DISEASE REPORTER

Issued By

Division of Mycology and Disease Survey

Volume XXI Number 2

February 1, 1937

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XXI Number 2

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AN ANALYSIS OF VOLUME XX OF THE PLANT DISEASE REPORTER

An analysis of the contents of the twentieth volume of the Reporter shows that the many interesting items included therein do not add up to a knowledge at all adequate of plant disease conditions in 1936, either for the country as a whole, or for any one region, or for any crop, or even, with a few exceptions, for any one disease. The fact that collaborators always very generously furnish any special information asked for either through the Reporter or by letter, and that a note on some unusual phenomenon often calls forth additional reports, both confirmatory and contradictory, indicates that the Survey's correspondents actually possess a great deal of material which reaches us only in response to some special request. This is no doubt due to the fact that although the single item may seem uninteresting, even trivial, by itself, the special request makes it evident that it would be very useful and even valuable when combined with other information. In many cases, there is no such special request and the item is not reported to the Survey and therefore does not become available to readers of the Reporter.

It is true that drought and heat have, again in 1936, caused heavy losses in many regions and reduced the incidence of, and correspondingly the interest in, plant diseases almost to a minimum. Whether it is failure to report or actual reduction in amount of disease that is responsible for the incompleteness of the account given in the Reporter is not evident even now in many cases and will be even less evident in future years when such knowledge might be of considerable importance.

It must be recognized that if plant diseases are recorded only when they are unusually prevalent or have just been discovered and therefore arouse great interest, there will result a false or at least an uncertain record of their incidence. An adequate history of a disease can be obtained only if periods of scarcity, as well as of abundance, are recorded. There is no assurance that when a disease is not reported it may not be present, perhaps even in considerable amounts. Negative reports are not so impressive to supply and to compile as those of epiphytotic occurrence, but they are, nevertheless, very important, since lack of reports may mean nothing.

Some of the missing information will be supplied later, in the annual report to the Survey, or in various summaries of the occurrence of diseases of particular crops or in particular regions during the year, many of which are sent in for inclusion in early numbers of the succeeding volume. However, current reports would not only be of timely interest but they would also contribute to the progressive account of disease conditions that readers look for in the Reporter.

The Plant Disease Reporter is the only source of general information in its field. The aim of the Survey is to obtain and to present in its

pages as complete a picture as possible of the development of disease during the year and throughout the country. Since the Reporter is entirely a cooperative effort--as the Survey fully realizes, and collaborators must certainly appreciate--the more complete the cooperation of pathologists, the more adequate the resulting picture will be. Isolated reports cannot give a true picture no matter how interesting and valuable the items may be in themselves.

The value of reports as complete as possible and from as large an area as possible is not immediately evident when only a single year is considered. Every attempt to study a disease from the standpoint of development, however, emphasizes the importance of the year-by-year recording of observations. Missing data can only rarely be supplied at a later time, and then sometimes merely by accident. It is the accumulation of records that is most valuable, not each piece of information by itself.

It is entirely possible that there is a point beyond which the accumulation of reports, on certain diseases at least, becomes no longer profitable except under some unusual condition. However, it requires a sure prophecy of the future to determine which records will in the long run be most needed, and it does not seem likely that a saturation point has been reached as yet in our records on even the most common and destructive diseases.

We attempt to cover the entire field. Perhaps if efforts at complete reporting were limited to certain diseases or certain crops on which it is practicable to gather definite and thorough information more could be accomplished with those particular diseases or crops, but in this case we would have to recognize that concentration on certain diseases would involve neglect of others that may eventually prove to be of far greater interest and importance.

Another very good reason, probably not fully appreciated, for urging cooperators to furnish information that is as complete as they can make it is the extent to which investigators depend upon the Reporter and the Supplements, as evidenced by citations in plant disease literature. To mention only a few instances, Elliott's "Manual of Bacterial Plant Pathogens" 1/ contains twenty-one such references and Chupp's "Manual of Vegetable-Garden Diseases" 2/ ten. In Rudolph's study of "Verticillium hadromycosis" 3/ there are eighty-two citations to the Reporter and the Supplements. Both the Reporter and the Supplements are regularly abstracted in the Review of

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1/ Elliott, Charlotte. Manual of Bacterial Plant Pathogens. 349 pp. The Williams and Wilkins Company, Baltimore. 1930.

2/ Chupp, Charles. Manual of Vegetable-Garden Diseases. 647 pp. The Macmillan Company, New York. 1925.

3/ Rudolph, B. A. Verticillium hadromycosis. Hilgardia 5:197-353. 1931.

Applied Mycology, Biological Abstracts, and the Experiment Station Record. Incidentally it may be mentioned that the Reporter has an international distribution, more than one hundred of its edition of almost nine hundred copies going to foreign countries, including forty to Canada.

Although it is an informal publication the Reporter has a recognized standing in its field, which standing is, of course, due entirely to its contributors. On the other hand much of the material that is furnished for the Reporter is of such a nature that it would have no other outlet or is doubly useful if published promptly. Publication in the Reporter is very much more prompt than anywhere else. There does, therefore, seem to be an interdependence--if it were not for its contributors there could be no Reporter, while if it were not for the Reporter much interesting and valuable material would not be made available, or at least not when it is most useful.

The primary function of the Reporter, as originally conceived, was the regular and timely dissemination of all available information on the current development of plant diseases throughout the country. During the past few years a new feature has been developing. Special brief articles up to a few pages in length, dealing with one or another of the aspects of disease distribution have been submitted to the Reporter in increasing numbers. These contributions constitute a welcome addition. They have all been interesting and contain important additions to our knowledge of plant diseases and plant disease distribution. They fall within the legitimate field of the Reporter. The continually increasing number of requests for a place on the mailing list is the surest evidence that they are appreciated and are serving a useful purpose. The continuance of these summaries and special articles in increasing numbers is solicited. At the same time, the attention of all collaborators is again directed to the original objectives of the Reporter, and their cooperation is asked to the end that they may not be lost sight of. (Jessie I. Wood).

NOTES ON THE EFFECT OF ENVIRONMENTAL CONDITIONS ON FRUIT CROP AND FRUIT DISEASES IN THE OZARK SECTION OF ARKANSAS AND MISSOURI IN 1936

(Cooperative work between the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, and the Arkansas and Missouri Agricultural Experiment Stations).

PART I. OBSERVATIONS IN ARKANSAS.

John C. Dunegan

In northwest Arkansas a sudden drop in temperature on April 2 and 3, almost completely eliminated the fruit crop. This disaster was followed by a prolonged drought and it is with some hesitancy that the writer has used the term "fruit crop" in the title. In the majority of the cases this crop existed only in the minds of the growers for a few days or a week as the buds were unfolding, and after April 3 it was represented by a mass of discolored blossoms.

Aside from the April freeze the 1936 season was a repetition of the 1934 season with the moisture deficiency situation even more serious than in 1934.

In 1935 the early part of the growing season was marked by a prolonged period of excessive precipitation and abnormally cool weather. Under these favorable conditions the scab fungus, Venturia inaequalis, rapidly became the dominant factor and caused more widespread damage than at any time since 1929. Leaf lesions were extremely numerous and since the fungus overwinters on these lesions the prospects were very favorable for a terrific outbreak of scab in 1936, but the outbreak did not materialize. In fact, it was difficult to find scab lesions on the foliage in 1936 and the season is an excellent illustration of how the fluctuating environmental conditions regulate the prevalence and economic importance of this fungus. Before discussing in some detail the prevalence or lack of prevalence of the various fruit disease fungi the two major environmental factors, the April freeze and the drought, will be discussed briefly as a setting for the subsequent remarks.

The April Freeze

Warm weather the latter part of March (the temperature reached a maximum of 80° and a minimum of 60° F. on March 29) had induced the rapid unfolding of the leaves and blossom buds. The temperatures began to drop rapidly on April 1 and at Fayetteville, Arkansas, reached a minimum of 21° during the early morning of April 2 and of 19° F. the following morning. After these two days of low temperature there followed a gradual return to higher levels, reaching a maximum of 85° F. on April 12.

The 1936 Drought

In discussing the 1936 drought it is important to realize at the beginning that the dry weather during the growing season did not follow, as it did in 1935, a period of excessive rainfall in the early spring months. The precipitation records (Table 2) as given for Fayetteville and Bentonville, Arkansas, in Climatological Record show that precipitation was deficient in January, February, and March 1936, as well as the succeeding months until September. The small positive departures in November and December 1935, at Fayetteville were scarcely sufficient to build up the subsoil moisture and even less rainfall was recorded at Bentonville, so that the trees started to grow in 1936 with a limited amount of moisture stored in the soil. When the precipitation deficiency continued month after month the situation became increasingly grave. A heavy rain on September 2 brought the first real relief but it was not until a prolonged period of rainy weather set in from September 16 to 24 that the drought period definitely ended.

The temperatures during this long period of precipitation deficiency were above the average during the months of May, June, and July and the readings for August exceeded all records for the state of Arkansas. During this month there were fifteen days with maximum readings at Fayetteville 100° F. and above, and the maximum reached 90° F. every day in the month, while the highest reading was 109° F. on August 10.

Table 2. Records of total monthly precipitation for two stations in northwest Arkansas, November 1935 to September 1936.

Year	Month	Fayetteville		Bentonville	
		Amount	Departure from normal*	Amount	Departure from normal*
		inches	inches	inches	inches
1935	November	4.51	+ 1.54	4.46	+ 1.32
	December	3.09	+ 0.34	2.10	- 0.27
1936	January	0.13	- 2.87	0.32	- 2.42
	February	1.54	- 0.66	1.34	- 0.81
	March	0.94	- 2.76	1.16	- 2.41
	April	1.86	- 2.74	1.45	- 3.41
	May	2.32	- 2.97	2.75	- 2.18
	June	0.74	- 4.00	1.59	- 3.73
	July	1.76	- 2.15	0.18	- 3.52
	August	0.95	- 3.09	0.08	- 4.10
	September	10.92	+ 7.37	10.32	+ 6.54

* Normal precipitation at Fayetteville is based on records for 49 years and at Bentonville on records for 31 years.

The Effect of the April Freeze

The injury from the April freeze was closely correlated with the degree of development of the buds, and less advanced orchards north of Fayetteville suffered less injury than those at Fayetteville. Throughout the entire district the Ben Davis trees suffered the most extensive injury as their buds were most advanced at the time of the freeze. Varieties such as Grimes, King David, Winesap, and Stayman escaped injury to a varying degree, while Ingram and Rome Beauty, late-developing varieties not extensively planted, escaped almost completely. Jonathan and Delicious were extremely variable: some orchards showed complete destruction of the crop while others showed only a small percentage of the total number of blossoms killed, and subsequently produced a fair crop.

The low temperatures which killed the blossoms also seriously injured the first whorl of leaves surrounding the blossom clusters and by April 18 these leaves were completely folded or otherwise distorted in shape and they ultimately were replaced by leaves developing after the freeze.

One orchard near Springdale, consisting of mixed varieties, apparently escaped injury while surrounding orchards lost their crop. An examination of this orchard on April 3 showed that the trees, which were planted very close together, were much retarded in their development. Just why these trees were slow in developing was not clear but it was evident at that time that this orchard was going to have a crop of fruit. Many of the leaves in this orchard showed signs of injury almost immediately in the form of brown

collapsed clusters of leaves scattered erratically over the north side of the trees. No injury of this type, which really represented leaves completely killed by the freeze, was observed on the south side of the trees, nor was it prevalent in other orchards. This orchard presented a number of anomalous conditions during the season and will be referred to again later in the discussion.

The effect of the freeze on apples was too variable to permit a definite generalization other than to say that in orchards at Fayetteville and southward the commercial crop was completely eliminated. North of Fayetteville the effect was closely correlated with the development of the trees in the individual orchards and varied from orchard to orchard.

Peach orchards in the immediate vicinity of Fayetteville and northward had their entire blossom crop destroyed. Peach trees in the southwest portion of the State escaped with a crop reduction that varied from orchard to orchard. In the Nashville area the Elberta variety had shed the calyces before the freeze and in most instances escaped injury, while later blooming varieties were badly injured. Trees on light land and more advanced in development suffered less than trees on heavy land which were retarded in their development and frequently had the entire crop destroyed even in the southwestern portion of the State.

The cherry industry is represented by several large Montmorency orchards in northwest Arkansas. In one of these orchards at Bentonville the buds had separated in the clusters, but few blossoms were open when the drop in temperature occurred. A count made in this orchard showed 67 percent of the buds dead. The petals and pistils were the floral parts which showed the injury while the stamens in most cases were not discolored and appeared to have escaped injury. The growers were able to market a 40 to 50 percent crop in spite of the freeze.

Effect of the 1936 Drought

The April freeze had eliminated a large portion of the apple crop in northwest Arkansas so that the effects of the drought in 1936 were almost entirely confined to the trees themselves. It is true that in those particular orchards that were fortunate enough to have a portion of a crop, the continued lack of rain prevented the fruit from reaching a normal size, but there were few such orchards. The freeze at first was considered a major disaster by most growers but as the season progressed the consensus of opinion was that the lack of a crop would probably enable the trees to come through the drought with a bud crop and prospects for 1937. If there had been a crop in 1936 the quality would have been so impaired by the continued moisture deficiency that it is doubtful whether it would have been commercially profitable and probably many trees would have died during the summer.

Twig growth was retarded to a considerable extent by the drought but the major effect visible at the end of the drought was the number of dead

trees in many localities. An examination of a number of orchards in October showed that there were not as many dead trees as might have been expected. The figures in Table 3 show that the Ben Davis variety was the one most seriously affected and in making the survey it was noted that the mortality was greater on thin land or in the high portions of the various orchards. Trees on heavy land and at the bottom of the slopes suffered much less.

Table 3. Apple orchard survey made in October, 1936, in Arkansas.

Location of orchard	Variety	Age	Number trees	Dead trees	
				Number	Percent
Fayetteville	Ben Davis	32	191	10	5.2
	Jonathan	32	108	1	0.9
	Winesap	32	143	3	2.0
	Collins Red	32	142	1	0.7
Springdale	Gano	35	450	60	13.3
	Lady Pippin	35	150	30	20.0
Farmington	Ben Davis	25	205	24	11.7
Johnsons	Ben Davis	35	700	169	24.1
	Stayman	22	184	5	2.7
	Delicious	22	90	2	2.2

Many trees throughout the district still bear the major trunk injuries caused by the 1930 freeze but these trees did not appear to have a higher mortality rate than trees without these gross trunk injuries.

The orchard near Springdale which escaped the freeze, as mentioned before, showed very severe injury with many more trees dying proportionately than in the surrounding orchards. The exact figures are not available but the increased mortality very probably is associated first with the fact that the trees are planted very close together and second that they had the additional burden of a partial crop of fruit.

This discussion of the effects of the drought only takes into consideration those effects visible at the end of the growing season. Many growers believe that the trees were so weakened that there will be a high mortality during the winter, particularly if there is any considerable period of below zero temperatures.

A secondary effect of the drought, and one that was rather general throughout the district, was a second growth of the shoots early in October and a scattered second bloom. This was the result of the cessation of growth during the drought followed by the stimulus of the September rains. Some trees blossomed so profusely that they will have a very light crop in 1937.

Effect of the 1936 Weather Conditions on Fruit Diseases

The 1936 season was not favorable for the development of fruit diseases. Apple scab (Venturia inaequalis), blotch (Phyllosticta solitaria), cherry leaf spot (Coccomyces hiemalis), peach leaf curl (Exoascus deformans), and peach brown rot (Sclerotinia fructicola), were conspicuous by their absence.

The apple scab fungus, as already mentioned, was extremely prevalent in 1935, and the prospects, judging solely from the amount of inoculum which overwintered on the fallen leaves, were extremely favorable for a further outbreak in 1936. The marked deficiency in rainfall during January, February, and March apparently delayed the maturation of the ascospores in 1936. In spite of frequent examination of overwintered material from March 21 to April 30, no mature perithecia were found on the leaves. On May 25 a few small leaf lesions were observed on non-sprayed Ben Davis trees, indicating that some perithecia must have matured and discharged ascospores early in May. At Fayetteville there was a period of rainy, humid weather from May 10 to May 12 inclusive and it is probable that the ascospores were discharged at that time. A final examination of overwintered leaves on May 26 showed mature perithecia but at this late date the drought had started and no further infections were noted.

The leaf infection first observed on May 25 was present only on the youngest leaves (first three or four from the tip of the shoots). The older leaves apparently had acquired a resistance to the fungus. In 1935 the first leaves were infected and later ones were attacked almost as soon as they appeared, with the result that almost every leaf developing during April and May showed infection.

In 1936 the leaves developing in April were not infected and when the disease finally appeared late in May only the very young leaves showed it. If environmental conditions had been favorable for the development of the disease in June, secondary infections would probably have developed on the new leaves as they appeared, but the bulk of the foliage on the trees would have been resistant. The weather conditions were not favorable for the subsequent development of the disease but if they had been the disease theoretically should not have produced extensive injury since there was a whole crop of leaves (developed during April) which were resistant to the fungus by the time the first ascospores were discharged.

The behavior of the scab fungus in 1936 is an excellent example of the close correlation existing between this disease and the environmental conditions. In 1934 the disease was present but not prevalent and overwintered inoculum was not abundant, yet enough ascospores were matured to produce the worst outbreak in 1935 that the district has experienced since 1929. Despite an abundance of overwintered inoculum the fungus was unable to cope with the adverse environmental conditions in 1936 and again became a disease of minor importance. These extreme fluctuations in a period of three years indicate that the only safe method of combating the disease is to pay particular

attention to the initial spray applications under the assumption that the disease is going to be important each year.

The cherry leaf spot fungus, Coccomyces hiemalis, was of little importance in 1936 and here again the adverse environmental conditions are largely responsible. This fungus caused widespread defoliation in 1935 but had been of only minor importance in 1934. The variation in prevalence of this fungus in the three-year period parallels the behavior of the apple scab fungus.

Occasional specimens of apple blotch (Phyllosticta solitaria) were observed on non-sprayed fruit during the season, but the fruit phase of the disease was of little importance. After the April freeze most of the growers stopped spraying and the vast majority of trees received no fungicides during the summer. This was a matter of no importance until the rains started in September. The late rains apparently furnished ideal conditions for blotch infections on the leaves, and susceptible varieties were heavily infected in October.

PART II. OBSERVATIONS IN MISSOURI

M. A. Smith

The growing season of 1936 in the Missouri Ozarks was marked by the most severe set of environmental conditions that has ever been experienced in this district. On March 23 the Marionville fruit district was the scene of a destructive wind and hailstorm. The storm apparently originated about 50 miles southwest of Springfield, Missouri, and at Marionville, which was in the direct path, hail fell at such a rate and in such quantities that it covered the ground to a depth of four inches. An inspection of apple orchards, particularly in the vicinity of Marionville, showed that the hail had knocked off a large number of fruit buds and had caused severe damage to the wood of the trees.

On April 1 the temperature dropped to 20° followed by a drop to 17° F. on April 2. At this time most of the buds of the earlier apple varieties were in the "cluster" stage and a large majority of these were killed. The buds of some of the later apple varieties at first appeared to have escaped serious damage by the freeze but by June 15 most of the fruit which had set earlier, had dropped. It appeared from an examination of such fruits that they had been injured early in their development and that the low temperatures existing during that time were responsible for the injury.

A few scattered trees in a number of orchards bore a partial crop of apples but in general the crop was almost a total failure throughout the district in 1936.

The 1936 Drought

The 1936 drought in reality had its beginning in the fall of 1935. The precipitation records for Springfield and Mountain Grove, Missouri, (Table 4) show that precipitation was deficient in those districts in the months of November and December, 1935, and from January through August, 1936. With the exception of a positive departure from the normal in the month of November at Mountain Grove, the records of the two stations are much alike.

Table 4. Records of total monthly precipitation for two stations in southwest Missouri, November 1935 to September 1936.

Year	Month	Springfield amount	Departure from normal *	Mountain Grove amount	Departure from normal *
		inches	inches	inches	inches
1935	November	2.50	- 0.29	4.07	+ 1.31
	December	0.62	- 1.69	1.40	- 1.08
1936	January	0.73	- 1.27	0.64	- 2.09
	February	1.01	- 1.42	1.06	- 1.17
	March	1.29	- 2.10	2.60	- 1.27
	April	2.37	- 1.49	2.53	- 1.99
	May	2.37	- 2.82	1.67	- 2.79
	June	2.05	- 2.63	3.25	- 1.69
	July	1.11	- 3.10	2.47	- 1.42
	August	0.78	- 3.31	0.47	- 3.87
	September	7.29	+ 3.77	7.45	+ 3.39

* Normal precipitation at Springfield is based on records of 48 years and at Mountain Grove on records of 35 years.

At the beginning of the growing season of 1936 the sub-soil moisture was very low. Fruit growers generally were agreed that without ample rainfall during late spring and summer, much damage to orchards would result. This much-needed rainfall failed to materialize and it was not until September that precipitation was received in sufficient quantity to replenish the sub-soil moisture.

The temperatures during the long period of precipitation deficiency were above the average during the months of May, June, July, and August. During the latter month, there were ten days at Springfield when the temperature was 100 degrees or over. At Mountain Grove there were sixteen days of 100 degrees or over. The lack of an apple crop was in all probability a fortunate circumstance. If there had been a crop the quality would have been so impaired by the continued moisture deficiency that it is doubtful if it would have been commercially profitable.

In addition to damage from drought in 1936, there was one of the worst grasshopper infestations of record. The grasshoppers were more prevalent in the northern half of the State but caused much damage to field crops throughout the southern half. Fruit trees in southwest Missouri were considerably

damaged by these insects. In some orchards all the foliage had been eaten by August 1 and the damage often extended to twig growth. Many of these trees, because of the lack of foliage, suffered severely from sun scald. Young trees (5 to 8 years) were apparently the most severely affected. On many of them scalded areas were found on the main trunks and on scaffold limbs.

A secondary effect of the drought and the grasshopper injury was a second growth of shoots and leaves in September and October and a scattered bloom.

A survey was made of 25 orchards in southwestern Missouri during October in order to obtain more information as to the effects of the drought on the trees. Counts were made of a number of varieties and the results showed that Ben Davis was the most severely affected. Of a total of 2212 Ben Davis trees, 376 or 17 percent had died during the summer and early fall. These trees averaged 30 years of age. It should be pointed out here that of the 376 Ben Davis trees that had died, 157 or 42 percent were infected with blister canker. A loss of 1 percent was recorded for Golden Delicious, 2 percent for Red Delicious, 3.6 percent for Stayman and York, and 3.8 percent for Winesap.

Seven plantings of four-year-old trees were observed in early July to have been defoliated by grasshoppers. When examined in October, 11 percent of the trees in these orchards were dead. Others appeared to be seriously weakened. With temperatures of zero or below this winter, it appears likely that others will fail to survive.

Fruit Diseases in 1936

The apple scab fungus, Venturia inaequalis, which assumed such serious proportions in southwestern Missouri in 1935, was practically non-existent in 1936. It appeared, from the abundance of scabbed leaves available in the fall of 1935, that with sufficient moisture during the winter and spring of 1936 there would be an abundance of ascosporic inoculum present.

There was, as previously pointed out, a marked deficiency in rainfall during December, 1935, and in January, February, and March, 1936. It appeared that this shortage of precipitation was responsible in part for the delay in development of perithecia. An examination of numbers of perithecia on April 1, 1936 showed that only 15 percent of the ascospores were mature.

The first observed ascosporic discharge in 1936 occurred on April 21 at Mountain Grove, and the second was noted on April 28 at both Springfield and Mountain Grove. On May 1 primary scab infection was observed on foliage of McIntosh and Red Delicious. This infection apparently originated from the ascospores discharged on April 21.

Perithecia were examined at intervals during the month of May and though it was evident that some were maturing, it was notable that by far the larger number were still immature. In some apparently mature perithecia, ascospores appeared to have developed abnormally.

By June 1 some scattered scab infections were noted on unsprayed trees in the Springfield and Mountain Grove districts. With the advent of dry, hot weather the spread of the disease was abruptly checked. Less apple scab was seen in southwest Missouri the past season than at any time during the past five years.

During the drought year of 1934, scab on apple foliage was practically non-existent. Abundant rainfall was received in late August and early September of that year, and following this rainfall there was a general infection of scab on late formed foliage. Studies made early in the winter and spring of 1935 showed that perithecia were developing in leaves infected in the fall as well as in the summer of 1934. It will be of interest to observe 1936 fall scabbed leaves with a view to determining their perithecial development in the spring of 1937.

The cherry leaf spot fungus, Coccomyces hiemalis, was of little importance in 1936 and here again adverse environmental conditions were largely responsible.

Occasional specimens of apple blotch, Phyllosticta solitaria, were observed on non-sprayed fruit during the season but the fruit phase of the disease in southwest Missouri was of little importance.

The pear leaf spot fungus, Fabraea maculata, was of little importance in southwest Missouri in 1936. This fungus caused widespread defoliation and considerable damage to fruit in 1935. The canker phase of the disease which was commonly seen in 1935, was very little in evidence in 1936.

OCCURRENCE OF TOBACCO DISEASES IN VIRGINIA IN 1936

J. A. Pinckard, James Godkin, and B. G. Henderson.

Plant Beds

Plant beds throughout the State were relatively free of disease. Downy mildew (Peronospora tabacina) was widespread, but owing to the dry weather did very little damage except in a few localities. In one community in Patrick County, a number of plant beds were severely damaged. This disease was also reported to have caused damage in certain areas in Brunswick County. Beds that were partly shaded by trees or were on low land where heavy dews occurred were most severely affected.

Field Diseases

A general survey was made in several counties but an intensive survey was made only in Pittsylvania County.

Sore shin (Rhizoctonia sp.). Sore shin was noted on 15 out of 51 farms in Pittsylvania County. A 25 percent loss caused by sore shin was estimated in one two-acre field. Tobacco had been grown every year in this

field for the past eight or ten years. In most fields, however, where sore shin occurred, the estimated loss was 1 or 2 percent, or less. This disease was also observed in Halifax, Patrick, and Brunswick Counties. Sore shin has occurred in the State, to a limited extent, for the past several years, but has not previously been observed to cause such serious loss.

Mosaic (virus) was observed in Pittsylvania County on 11 farms out of 51 surveyed. In most cases the disease was present on only a few plants but in certain fields almost 100 percent of the plants were affected. One field of approximately eight acres, which had been cleared of woods the preceding winter, showed 100 percent infection. The plant beds from which this field had been set showed an occasional diseased plant. No sanitary measures were practiced by the workmen to avoid contaminating the plants when pulling and setting, or during the process of weeding the beds.

In other counties of the bright tobacco district, mosaic was of general occurrence. Except in Washington County, mosaic has never become a problem in the Burley tobacco district.

There was considerably more burning or sun scalding of mosaic infected leaves this year than in previous years. This condition was probably brought about or aggravated by the unusually hot, dry weather this year.

Granville wilt (Bacterium solanacearum) is known to occur in several areas of the State but is not widespread. In one community of Halifax County, this disease has become so serious on a few farms that the growers are discontinuing tobacco culture. In Pittsylvania County, Granville wilt was observed on six farms. In Patrick County it was observed in a two-acre field causing an estimated loss of 5 percent.

Root knot (Heterodera marioni) was observed causing severe losses on small areas on four farms in Pittsylvania County and on one farm each in Patrick and Halifax Counties.

Black root rot (Thielaviopsis basicola) was less pronounced this year than in previous years because of high temperature. It was observed in Halifax, Pittsylvania, and Patrick Counties of the bright tobacco district. In the Burley district, this disease was of general occurrence. Seed of a resistant variety of Burley was obtained from the Kentucky Experiment Station and distributed to several growers in Lee County. This variety stood up well on infested soil and produced a striking contrast to susceptible varieties grown in the field.

Brown spot (Alternaria longipes) was of widespread occurrence late in the summer and caused severe damage to late tobacco. On cured leaves being sold at the Danville market, brown spot could be observed at will.

Ring spot (virus) was more prevalent than usual. In Nottaway, Brunswick, and Prince Edward Counties the disease was widespread, and in some fields caused marked injury. There was evidence that insects were responsible for the introduction and spread of this disease.

Angular leaf spot (Bacterium angulatum) was observed in several areas but did not cause any serious loss.

Hollow stalk (Bacillus aroideae) was observed in Pittsylvania County.

Fusarium wilt (F. oxysporum nicotianae) was observed in one field in Lee County. This is the first report of this disease from the State.

Sand drown (magnesium deficiency) was observed in Pittsylvania County. Slight to severe symptoms of potassium starvation were of general occurrence.

The season of 1936 presented several unusual weather conditions. During the field planting season of May, the mean temperature was 1.3° F. above normal while rainfall was 2.37 inches below normal. Many missing hills were not replanted and many fields were not planted until later. The drought and high temperatures at this season discouraged many growers from planting their usual acreage. Furthermore, the drought and the soil conservation act caused many farmers to abandon fields which in the past had shown diseases and poor quality tobacco. Later plantings in many instances resulted in delayed maturity and an increase in the brown spot disease which made its appearance in the latter part of August.

During August, high temperatures together with bright sun and light showers caused considerable burning on mosaic diseased leaves and some damage to normal leaves.

Hail caused damage only in local areas of the county.

Tobacco insects were held in check in most cases although late in the season the flea beetle became a serious pest in local areas.

Table 5 shows a summary of the estimated losses caused by various tobacco diseases in certain fields in Pittsylvania County, Virginia, in 1936.

Table 5. Losses caused by tobacco diseases observed in certain fields in Pittsylvania County, Virginia, in 1936.

Disease	Number of farms showing disease	Total combined acreage of fields observed	Estimated losses in percent
Sore shin	16	71	4
Mosaic	11	15	2
Granville wilt	6	38	6
Black root rot	4	20	less than 1
Root knot	4	15	5
Brown spot	4 a/	21	75
Ring spot	2	15	6
Angular leaf spot	2	10	less than 1
Hollow stalk	1	5	less than 1
Sand drown	1	5	less than 1

a/ Other farms showed widespread distribution in county.

(Virginia Agricultural Experiment Station, Tobacco Research Laboratory).

"CONCEALED DAMAGE" OF RUNNER PEANUTS IN GEORGIA

H. W. Rankin

A condition designated as "concealed damage" of runner peanuts was prevalent in Georgia in 1936. Rather large quantities of these nuts have been finding their way to the shellers in the past few years and have been bought by the confectioners.

The "concealed damage" is a moldy condition which occurs between cotyledons and can not be seen without separating the two halves of the nuts. The flesh of the nut is discolored and has a rancid taste making it unfit for use in confections. In this year's crop, according to the shellers, 35 to 40 percent of the runner peanuts received have contained enough to be rejected by the confectioners and some enough to be refused by the oil mills.

Examinations and isolations have shown that this trouble was caused by several soil fungi, particularly Rhizoctonia bataticola and other species of Rhizoctonia, which penetrated the shell of the nuts after they were harvested and stacked in a wet, green condition.

Spanish peanuts do not seem to be affected. (College of Agriculture, University of Georgia).

RICE KERNEL SMUT IN TEXAS

E. C. Tullis

Rice kernel smut caused by Tilletia horrida Tak. was found for the first time in Texas in 1936.

The number of smutted kernels in samples of threshed rice of different varieties grown near Rosharon, Brazoria County, Texas, in 1936 was as follows:

Variety	Smutted kernels	
	Number	Percent
Rexore	187	.88
Rexore	117	.27
Fortuna	183	.57
Blue Rose	107	.54
Nira	21	.06

None of the infected Nira seeds were as severely smutted as those of the other varieties. (Division of Cereal Crops and Diseases).

LITTLE LEAF RUST OF WHEAT IN THE PLAINS REGION

C. O. Johnston

Observations, correspondence, and verbal statements of responsible observers indicate that leaf rust infection on volunteer and fall sown wheat has been practically nonexistent this fall over the whole Plains area from central Texas to the Canadian border. In the light of the present situation, it seems unlikely that a heavy epidemic of leaf rust will occur in this area in 1937. Unless rather heavy infections develop early in central Texas, and the spring of 1937 is very favorable for the development of leaf rust in the hard winter wheat belt, the infection in general should be very light. (Cereal Courier 29:9. Jan. 10, 1937).

NOTES ON THE STINKING SMUTS OF WHEAT IN TURKEY IN THE 1936 CROP

Donald P. Limber

In the inspection of foreign seeds entering the United States through the inspection house of the Bureau of Entomology and Plant Quarantine 107 one- or two-ounce samples of Turkish wheats were examined recently. Thirty-three samples were found to carry the stinking smuts. Of these only three were the rough-spored species, Tilletia tritici (Bjerk.) Wint. All of the others were the smooth-spored Tilletia laevis Kühn. Inasmuch as the 107 samples were from 39 widely scattered towns or localities, and the 33 infected samples were from 16 of these different localities, it is probable that the proportion of the two species to each other as found in the samples fairly represents the distribution of the two species in Turkey in 1936.

Other diseases found on these samples include: Puccinia graminis found in 8 samples (on glumes and rachis), Puccinia glumarum in 3 samples (on the inner side of the glumes), and the wheat nematode Anguina tritici (Steinbuch) Filipjev in one sample. (Bureau of Entomology and Plant Quarantine).

CROWN GALL OF THE FASCIATED TYPE ON ASPARAGUS SPRENGERI

Nellie A. Brown and Freeman Weiss

Instances of crown gall on monocotyledonous plants are rare. They have been produced on the basal plate of onions and on caladium petioles by inoculations with pure cultures of Bacterium tumefaciens. In keeping with the general rule that monocots are not attacked by crown gall is the fact that Asparagus sprengeri and also A. plumosus nana had never been observed by the staff of the late Erwin F. Smith's laboratory to be so infected although specimens of these plants were nearly always present in the greenhouse where the extensive crown gall investigations by these workers were carried on. Natural exposure did not result in crown gall infection of

these Asparagus spp., probably owing to the fact that seedling asparagus plants were not grown in those greenhouses. Propagation was by division of mature plants. Accordingly, when two specimens of a gall on A. sprengeri, one collected by F. P. McWhorter in Albany, Oregon, in 1933, and one by a commercial grower of ornamental asparagus in Winter Haven, Florida, in 1935, were submitted to us, especial interest was felt in determining their nature. In each case the galls appeared to originate as much deformed sprouts from the crown at or slightly above the ground level, similar to the fasciated shoots known on sweet peas and other plants to result from infection by B. tumefaciens or related organisms. They were quite distinct from the tuberized roots, characteristic of this asparagus. There was no infestation by parasitic nematodes of either the root-knot or shoot infecting types. Attempts to isolate B. tumefaciens were unsuccessful because of the desiccated state of the specimens. Thwarted in directly proving the nature of these galls, but still of the opinion that they were of crown gall nature, we undertook to reproduce them by inoculating the plumule of germinating seeds of A. sprengeri, or the basal part of the stem of slightly older seedlings, grown in sterilized soil, using two different strains of B. tumefaciens. The hop strain failed to produce infection but the dahlia strain produced a mass of fleshy stem-like outgrowths. In one plant, several galls of the same appearance as the natural specimens were produced, and from these the crown gall organism was re-isolated and its identity proved by the production of typical stem galls in Ricinus, Paris daisy, and garden balsam. It appears to us that the original specimens actually represented crown gall infections on this exceptional host, and that this is another instance of the ability of B. tumefaciens to induce shoot fasciation when very young tissues are inoculated.

Recently Lacey (Ann. Appl. Biol. 23 (4):743-751, 1936) has reported the isolation of a bacterium capable of causing fasciation of sweet peas from galls on several plants, including asparagus (species not named) and gladiolus. (Division of Fruit and Vegetable Crops and Diseases).

RELATIVE SUSCEPTIBILITY OF CERTAIN VARIETIES OF DAHLIAS TO ROOT-KNOT NEMATODE

Robert Schmidt

During the past four years the writer has had the opportunity to observe the relative susceptibility of a number of varieties of dahlias to the root-knot nematode, Heterodera marioni, when grown on infested soils. There appears to be a decided difference in the severity of infection of various varieties when grown under conditions favorable to the disease. They are listed according to severity of infection.

Severe infection

Aiko
Karl Bonawitz
Shahrazade
Dwight W. Morrow
Congressman Wolverton
Frau O'Bracht
Buckeye Bride
Treasure Island
Prince of Persia
Eagle Rock Fantasy
Kathleen Norris
Dee Dee (Pompon)
Fascination (Pompon)

Moderate infection

Mrs. I. de Ver Warner	Kentucky
Mary Ellen	Jane Ross
Monmouth Champion	Full Moon
Cigarette	Blue Train
Jersey's Beauty	

Light infection

Jane Cowl	Long Hill
Fort Monmouth	Dancing Sultana
Jean Trimbee	Monmouth Radiance
City of Trenton	Satan
White Wonder	Fordhook Marvel
Alice Whittier	Little Edith (Pompon)
Lady Moyra Ponsonby	Gertrude (Pompon)
Mrs. Bruce Collins	Atom (Pompon)
Robert Emmett	Yankee King
Ida Perkins	

In case of the varieties listed under the heading "severe", the tuberous roots and sometimes the crowns were badly knotted and distorted. In case of the varieties listed under "light", the large tuberous roots were mostly smooth and clean but there was some infection of the small rootlets. Observations were, in most cases, made on several plants of each variety. (North Carolina Agricultural Experiment Station).

DISEASES OF SHADE AND ORNAMENTAL TREES: SUMMARY OF SPECIMENS RECEIVED IN 1935 AND 1936 AT THE NEW HAVEN OFFICE, DIVISION OF FOREST PATHOLOGY

Alma M. Waterman

ABIES

NEEDLE BLIGHT (Rehmiellopsis bohemica) British Columbia on Abies lasiocarpa; Maine on Abies balsamea.

DIE-BACK (Sphaeropsis sp.) New York on Abies concolor.

ACER

TWIG BLIGHT (Coryneum negundinis) Maine on Acer negundo.

ANTHRACNOSE (Gloeosporium apocryptum) New Jersey.

LEAF-SPOT (Septogloeum acerinum) Virginia.

LEAF BLISTER (Taphrina sp.) Arkansas, North Carolina, Virginia.

POWDERY MILDEW (Uncinula circinata) New Jersey.

WILT (Verticillium sp.) New Jersey on Acer rubrum and A. saccharum; New York on A. platanoides; Virginia on A. platanoides and A. saccharum.

AESCULUS

LEAF BLOTCH (Guignardia aesculi) Maryland, New Jersey, New York, Pennsylvania, Virginia, on A. hippocastanum; Wisconsin on A. glabra.

POWDERY MILDEW (Uncinula flexuosa) Maryland on A. hippocastanum.

BETULA

CANKER (Cytospora chrysosperma) Montana on B. papyrifera.

LEAF BLISTER (Taphrina sp.) Maine on B. lutea.

CEDRELA

CANKER (Cytospora sp.) Virginia.

CEDRUS DEODARA

CANKER (Sphaeropsis sp.) Virginia.

CELTIS

CANKER (Sphaeropsis sp.) Texas.

CERCIS CANADENSIS

CANKER (Botryosphaeria sp.) District of Columbia.

CRATAEGUS

RUST (Gymnosporangium germinale) Connecticut, New York, Pennsylvania, Virginia.

CANKER (Sphaeropsis sp.) Pennsylvania.

ELEAGNUS

CANKER (Harpographium sp.) Georgia on Eleagnus pungens.

FAGUS

DIE BACK (Phomopsis sp.) Pennsylvania on Fagus sylvatica purpurea.

FRAXINUS

ANTHRACNOSE (Gloeosporium aridum) Virginia, Tennessee.

GINKGO BILOBA

LEAF SPOT (Phyllosticta ginkgo) Pennsylvania.

GLEDITSIA TRIACANTHOS

CANKER (Dothiorella sp.) Mississippi.

ILEX OPACA

LEAF SPOT (Coniothyrium ilicinum) New York.

LEAF SPOT (Diplodia ilicicola) New York.

POWDERY MILDEW (Phyllactinia corylea) Tennessee.

TAR SPOT (Rhytisma sp.) Virginia.

JUGLANS SIEBOLDIANA

CANKER (Melanconis juglandis) Connecticut.

JUNIPERUS

RUST (Gymnosporangium juniperi-virginianae) Delaware, Massachusetts, New Jersey, Pennsylvania.

MAGNOLIA

DIE-BACK (Phomopsis sp.) Pennsylvania.

MALUS IOENSIS

RUST (Gymnosporangium juniperi-virginianae) Connecticut, Massachusetts, New Jersey, New York.

PICEA

CANKER (Cytospora kunzei) Illinois, New York, on Picea excelsa; New York on P. orientalis; Massachusetts on P. glauca; Massachusetts, New Jersey, New York, Vermont on P. pungens; Maine on P. rubra.

RUST (Melampsoropsis ledicola) Maine on P. glauca.

PINUS

CANKER (Caliciopsis pinea) South Carolina, West Virginia, Tennessee on Pinus strobus.

CANKER (Cytospora sp.) Virginia on Pinus excelsa; Connecticut on P. ponderosa; Illinois on P. strobus.

LEAF CAST (Lophodermium pinastri) Kentucky.

TIP BLIGHT (Sphaeropsis ellisi) Connecticut, New York, Virginia, on Pinus montana; Maryland, New York, Oklahoma, Pennsylvania, Virginia, on P. nigra; Pennsylvania on P. resinosa; New York, Ohio on P. sylvestris.

POPULUS

CANKER (Cytospora chrysosperma) Maryland on Populus nigra italica.

CANKER (Dothichiza populea) Rhode Island on P. nigra italica.

LEAF SPOT (Septoria populicola) Illinois, Indiana.

PSEUDOTSUGA TAXIFOLIA

CANKER (Cytospora sp.) Oregon.

LEAF CAST (Rhabdocline pseudotsugae) Rhode Island.

TIP BLIGHT (Sphaeropsis ellisi) New York.

QUERCUS

TWIG BLIGHT (Diplodia longispora) California, Maryland, Wisconsin.

ANTHRACNOSE (Gnomonia veneta) Illinois, Maryland, North Carolina, Wisconsin, on Q. alba.

ROT (Nummularia punctulata) Mississippi on Q. nigra.

LEAF BLISTER (Taphrina coerulescens) Arkansas, North Carolina, South Carolina, Tennessee, Virginia.

SALIX

CANKER (Cytospora chrysosperma) Arizona, Connecticut.

LEAF SPOT (Marsonia salicicola) New York.

STEM CANKER (Septomyxa exultata) Connecticut.

SORBUS AMERICANA

CANKER (Sphaeropsis sp.) New Jersey.

TILIA AMERICANA

ROT (Ustulina vulgaris) New York.

TSUGA CANADENSIS

CANKER (Gelatinosporium abietinum) Massachusetts.

ULMUS

LEAF SPOT (Coniothyrium ulmi) Nebraska.

CANKER (Cytospora sp.) Pennsylvania.

BLACK LEAF SPOT (Gnomonia ulmea) Alabama, District of Columbia, Georgia, Kentucky, Maryland, Minnesota, Mississippi, Missouri, New Hampshire, North Carolina, South Carolina, Vermont, Virginia.

CANKER (Phomopsis oblonga) South Carolina.

CANKER (Sphaeropsis sp.) Mississippi.

WILT (Verticillium sp.) Indiana.
(Division of Forest Pathology).

THE DROUGHT OF 1934 AND ITS EFFECT ON TREES IN KANSAS

This is the title of a discussion by Elsa Horn Stiles and Leo E. Melchers of drought injury to trees in Kansas in the Transactions of the Kansas Academy of Science, vol. 38, pages 107-127, 1935.

ERWIN F. SMITH REPRINTS AVAILABLE

The Division of Mycology and Disease Survey has recently received the remainder of the separates of many of the publications of the late Erwin F. Smith, including for the most part his later papers on the crown gall problem. A set of these reprints will be sent on request to any institution or technical worker interested.

PRECIPITATION FOR THE YEAR 1936

(From the Weekly Weather and Crop Bulletin, for week ending January 19, 1937).

Since 1929 there have been 3 outstandingly dry years in the United States, 1930, 1934, and 1936. The 1930 drought was most severe from the central Mississippi Valley eastward, while in both 1934 and 1936 the relatively greatest shortage in rainfall occurred in the Midwest, principally between the Mississippi River and Rocky Mountains.

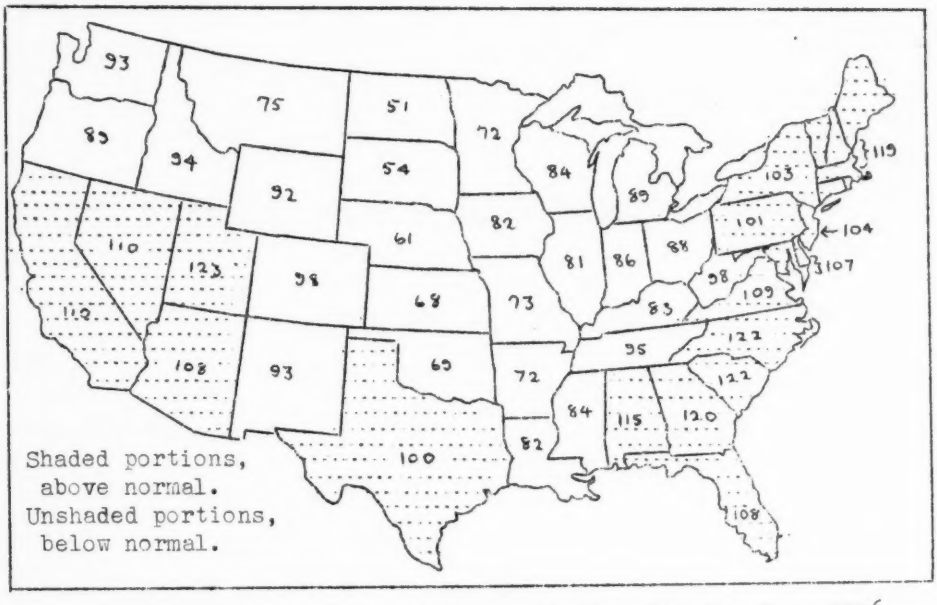


Fig. 3. Percentage of Normal Precipitation for the Year 1936 (State Averages).

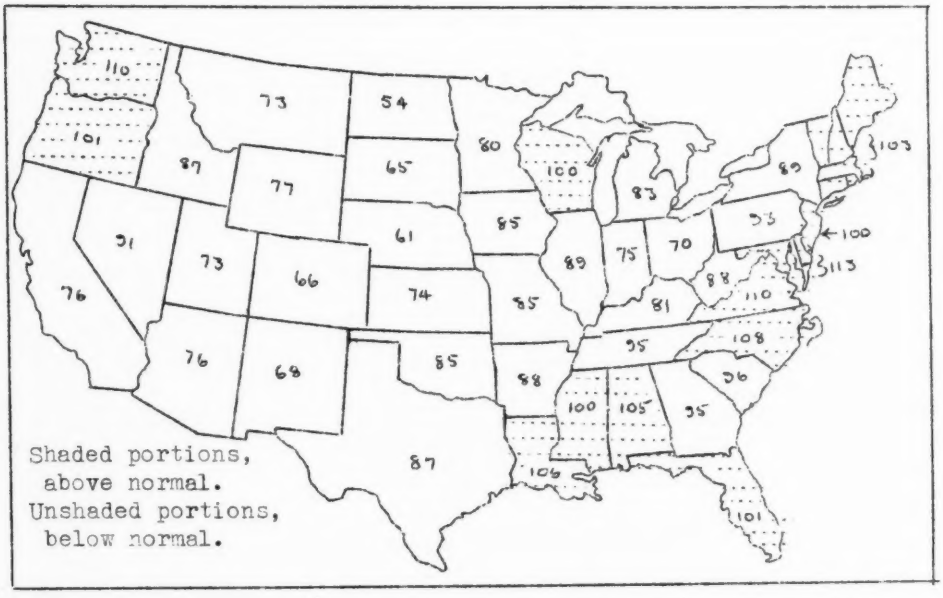


Fig. 4. Percentage of Normal Precipitation for the Year 1934 (State Averages).

Figure 3 shows the percentage of normal precipitation, by States, for 1936, and Figure 4, for comparative purposes, like data for 1934. In a good many ways these charts are strikingly similar. In both years precipitation was near normal, or above, in the more eastern States and over parts of the far West, with the greatest deficiencies in the central and northern Plains and adjoining sections. The eastern Ohio Valley and the Southeastern States had considerably more rain in 1936 than in 1934, also the far southwest. On the other hand, in most north-central sections the shortages of moisture in 1936 were greater than in 1934. Since the beginning of the new year precipitation has been abnormally heavy over most of the eastern half of the country and parts of the far West.

Records for the 7-year period from 1930 to 1936, inclusive, show less than normal precipitation in all sections of the country, except in a few widely scattered States. New England, Maryland, Florida, Arizona, and Washington had somewhat above normal for the period and all other States below normal. Based on the normal for the 7-year period, South Dakota was the driest, with 77 percent, followed in turn by North Dakota, 80 percent, Montana, 81 percent, Nebraska, 84 percent, and Minnesota, 86 percent of normal. All States east of the Mississippi River had more than 90 percent of the normal for this 7-year period.

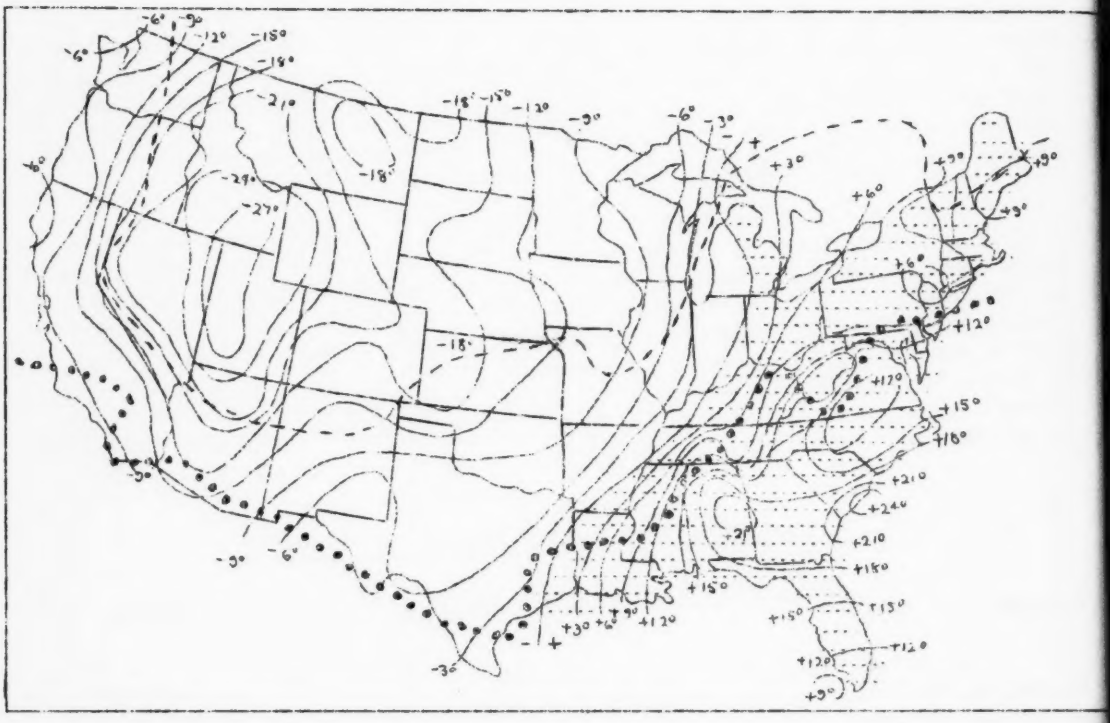
ANOTHER SEVERE FREEZE IN THE FAR WEST

(From the Weekly Weather and Crop Bulletin for the week ending January 26, 1937).

The outstanding features of the week's weather were the unprecedented floods in the Ohio Valley, severely damaging freezes in the south Pacific area, and abnormal warmth in the more eastern States. (Figure 5).

For the second time since January 1 a severe freeze occurred in Pacific Coast States, which was especially damaging to citrus fruits and truck in southern California. In the citrus districts some of the minimum temperatures and durations below 28° were as follows: Corona 21°, duration 10 hours; Arlington, 21°, 8 hours; Riverside 20°, 11 hours; High Grove 19°, 11 hours, with the high ground as cold as the low areas, total crop loss reported in unheated groves with some damage where heated; Azuza 21°, duration 16 hours; Whittier 20°, 14 hours, with total crop loss in unheated groves, and only 5,000 out of 73,000 acres protected. It is too early for reliable estimates of total damage from the two freezes, but it has been extremely heavy. There was also additional damage to winter-truck crops, especially in the Imperial Valley.

In contrast to this the continued abnormally warm weather in the Southeastern States has advanced all vegetation to a decidedly precarious position, being in many cases fully a month ahead of normal. In Florida temperatures were comparable to the normal for May. As a result of the warmth, early fruit trees have begun to bloom as far north as southern South Carolina. Peaches in Georgia, especially, are now dangerously advanced.



Shaded portions show excess (+). Unshaded portions show deficiency (-). Lines show amount of excess or deficiency. ····Southern limit of freezing weather. ----Southern limit of zero temperatures.

Fig. 5. Departure of Mean Temperature from the Normal for the Week Ending 7:30 a. m., January 26, 1937.